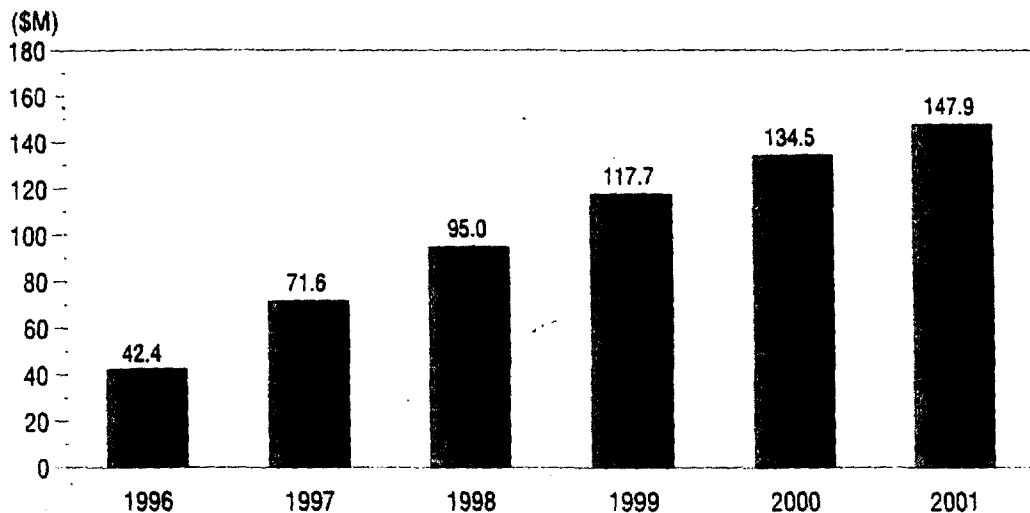


SMDS

The SMDS market will reach \$71.6 million in 1997, a 69% increase over 1996's \$42.4 million. IDC forecasts that the market will reach \$147.9 million in 2001, a 1996–2001 CAGR of 28% (see Figure 49). Although SMDS will be a growth market during the forecast period, growth will be more modest than previously forecast by IDC (see the national/international forecast in *Business Network Services, 1995–2000: Shifting Service Composition*, IDC #11417, May 1996). The previous forecast also looked at pure SMDS and SMDS-like ATM services, whereas the current forecast looks at pure SMDS only.

Figure 49
U.S. SMDS Service Revenue, 1996–2001



Source: International Data Corporation, 1997

Unlike frame relay and, increasingly, ATM, which are emerging as mass-market business technologies, SMDS is becoming a niche application/vertical-market service.

Unlike frame relay and, increasingly, ATM, which are emerging as mass-market business technologies, SMDS is becoming a niche application/vertical-market service for large customers that need any-to-any connectivity and multicasting capabilities, such as those in the publishing/printing, financial, and entertainment industries.

Table 38 presents IDC's customer and port forecasts for 1996–2001. Port growth will outpace customer growth because existing customers will add more ports as needed, but there will not be a significant influx of new SMDS customers during the forecast period.

With regard to port speed distribution, the fractional T3 segment will experience the highest growth rate — 28% during the forecast period (see Table 39). However, T1 ports, which accounted for 56.9% of SMDS ports in 1996, will continue to account for the majority of ports, falling to only 56.6% in 2001 (see Figure 50).

Table 40 and Figure 51 show IDC's forecast for customer segment distribution of SMDS revenue. The corporate segment's share of total revenue will increase from 54% in 1996 to 69% in 2001 because of expanding interenterprise communications requirements. Government is a significant customer segment for certain local service providers (particularly Ameritech), but it will decrease as a percentage of the total during the forecast period as the corporate segment becomes more important. The other network service provider segment will remain relatively constant from 1996 to 2001 as certain local providers (particularly Bell Atlantic, but also Pacific Bell, to a lesser extent) promote SMDS-based backbone connectivity to ISPs. Bell Atlantic has an IP routing service featuring the use of SMDS to aggregate traffic from remote locations for transport to ISPs or corporate networks.

Table 38
U.S. SMDS Customers and Port Installed Base, 1996-2001

	1996	1997	1998	1999	2000	2001	1996-2001 CAGR (%)
Customers	644	782	935	1,024	1,117	1,173	12.7
Ports	6,883	10,172	13,392	15,754	17,635	18,884	22.4
Average ports per customer	11	12	14	15	16	16	8.5

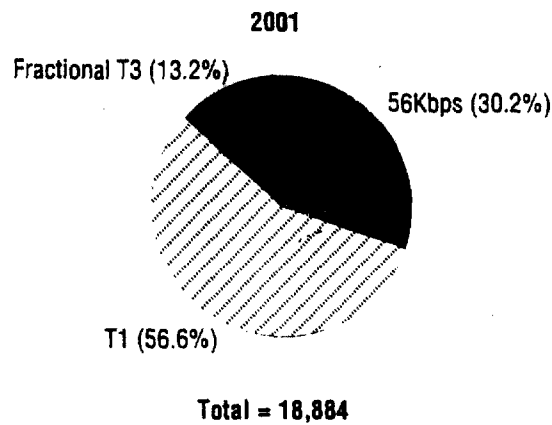
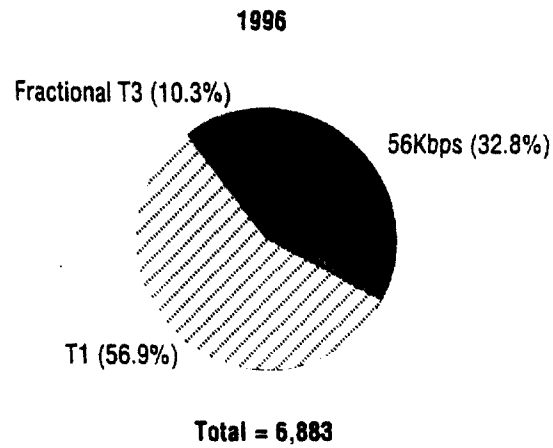
Source: International Data Corporation, 1997

Table 39
U.S. SMDS Port Installed Base by Access Speed, 1996-2001

	1996	1997	1998	1999	2000	2001	1996-2001 CAGR (%)
56Kbps	2,258	3,432	4,342	4,924	5,350	5,705	20.2
T1	3,918	5,638	7,570	8,850	10,019	10,690	22.2
Fractional T3	707	1,102	1,480	1,980	2,267	2,488	28.2
Total	6,883	10,172	13,392	15,754	17,635	18,884	22.4

Source: International Data Corporation, 1997

Figure 50
U.S. SMDS Port Installed Base Share by Access Speed, 1996 and 2001



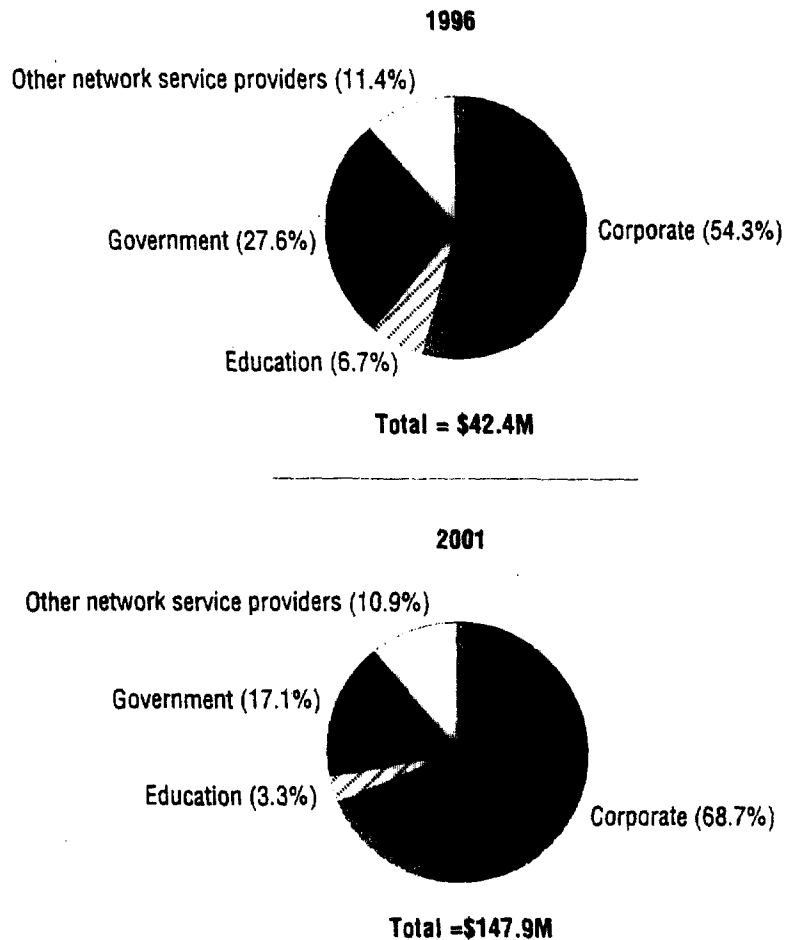
Source: International Data Corporation, 1997

Table 40
U.S. SMDS Service Revenue by Customer Type, 1996-2001 (\$M)

	1996	1997	1998	1999	2000	2001	1996-2001 CAGR (%)
Corporate	23.0	41.5	57.6	74.6	88.9	101.6	34.6
Education	2.9	4.8	5.5	5.8	5.5	4.8	11.1
Government	11.7	17.7	21.6	24.5	25.5	25.3	16.7
Other network service providers	4.8	7.6	10.2	12.8	14.7	16.1	27.3
Total	42.4	71.6	95.0	117.7	134.5	147.9	28.4

Source: International Data Corporation, 1997

Figure 51
U.S. SMDS Service Revenue Share by Customer Type, 1996 and 2001



Source: International Data Corporation, 1997

Market Forecast Assumptions

The following assumptions pertain to the SMDS market:

- SMDS will enjoy continued success in specific industry sectors that value high-bandwidth connectionless services and tend to have a large number of sites or partners within a certain geographic area. These vertical markets include publishing/printing, entertainment, real estate, finance, and health care, which need support for bulk file transfer (data and video), interenterprise communications with a changing universe of partners, and broadcasting capabilities. SMDS's any-to-any connectivity enables these industries to bring dispersed sites together in easy-to-implement mesh networking topologies.

Currently, SMDS possesses some unique service capabilities (any-to-any connectivity and multicasting). However, service providers' implementation of ATM SVCs (connectionless ATM) may steal some of SMDS's thunder.

- In horizontal markets, IDC predicts that SMDS will not find widespread acceptance, given that frame relay has emerged as the preferred solution for wide area networking (i.e., replacement of WANs based on private lines). However, SMDS's any-to-any architecture makes it appropriate for any industry sector that has deployed client/server applications, such as corporate intranets, and needs to distribute these applications across a network.
- Currently, SMDS possesses some unique service capabilities (any-to-any connectivity and multicasting). However, service providers' implementation of ATM SVCs (connectionless ATM) may steal some of SMDS's thunder. In addition, ATM holds out the promise of consolidation of data, voice, and video traffic; there are no voice applications for SMDS. Carriers also plan to implement frame relay SVCs eventually, facilitating better any-to-any connectivity and more cost-effective meshed networks. Finally, carrier implementation of fractional T3 and T3 frame relay provides frame relay with scalability features similar to those of SMDS.
- Bell Atlantic and MCI each plan to roll out service interworking between their respective SMDS and ATM services by yearend 1997. This capability will enable SMDS users to migrate to ATM without writing off their SMDS investments.

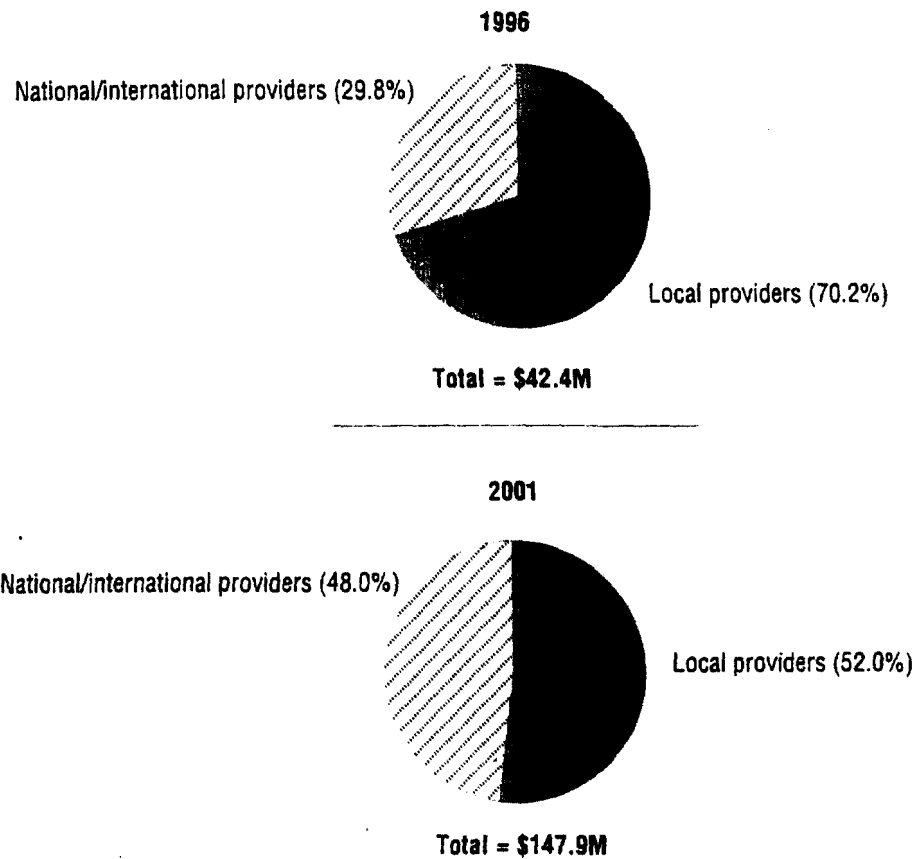
SMDS has a stronger foothold in local markets, due to broader local provider support for the service.

Segmentation Analysis: Local and National/International Market

SMDS has a stronger foothold in local markets, due to broader local provider support for the service. Figure 52 shows that local providers accounted for 70% of total SMDS revenue in 1996. This percentage will fall to 52% in 2001 as the inter-LATA communications requirements of local SMDS customers expand.

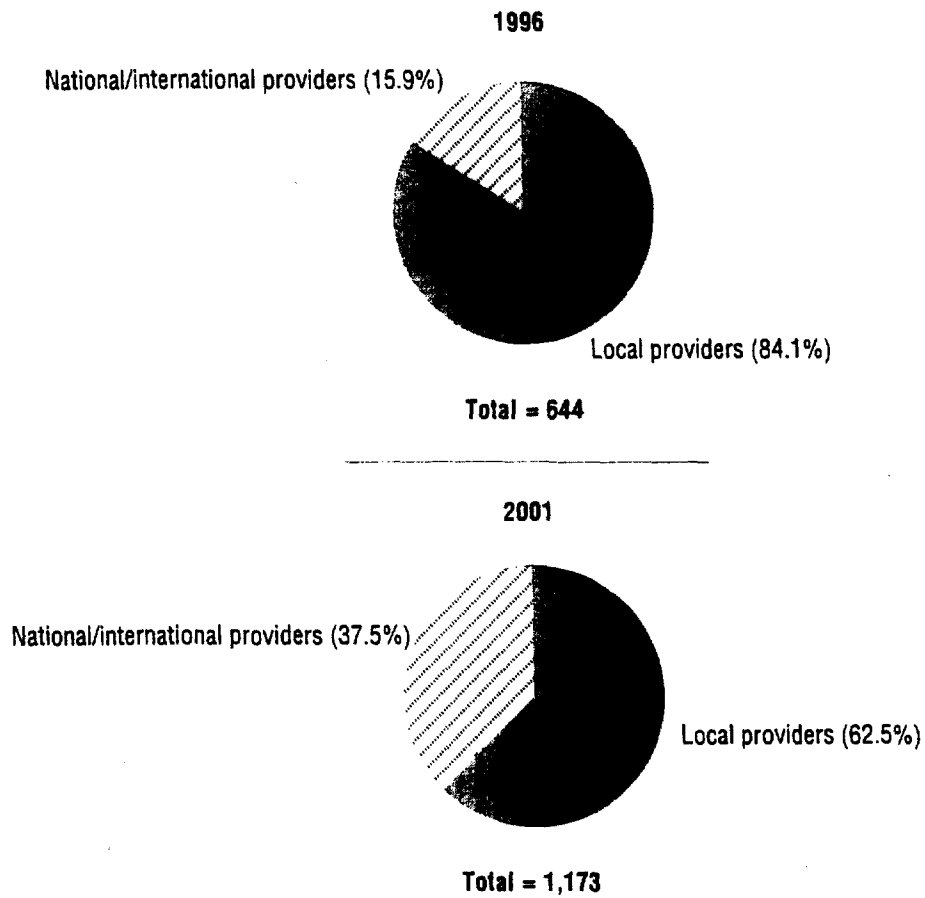
Figure 53 shows that local providers' percentage of total SMDS customers will fall from 84% in 1996 to 62% in 2001. Local providers' share of total SMDS ports will also fall from 85% in 1996 to 78% in 2001 (see Figure 54).

Figure 52
U.S. SMDS Service Revenue Share by Provider Segment, 1996 and 2001



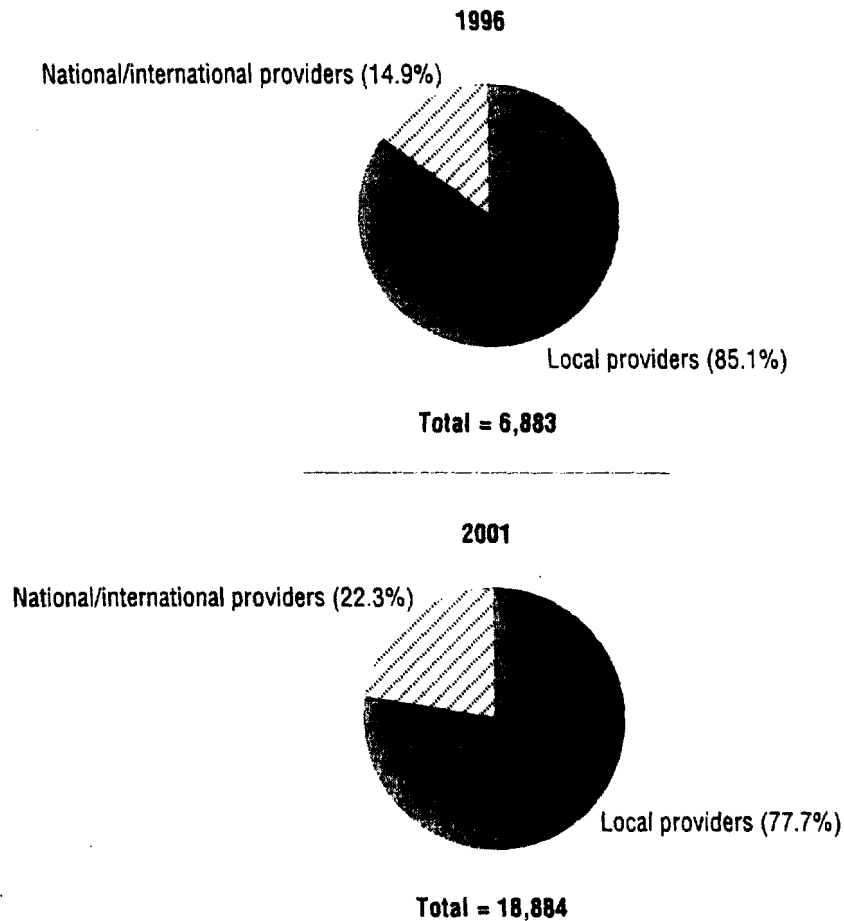
Source: International Data Corporation, 1997

Figure 53
U.S. SMDS Customer Share by Provider Segment, 1996 and 2001



Source: International Data Corporation, 1997

Figure 54
U.S. SMDS Port Installed Base Share by Provider Segment, 1996 and 2001



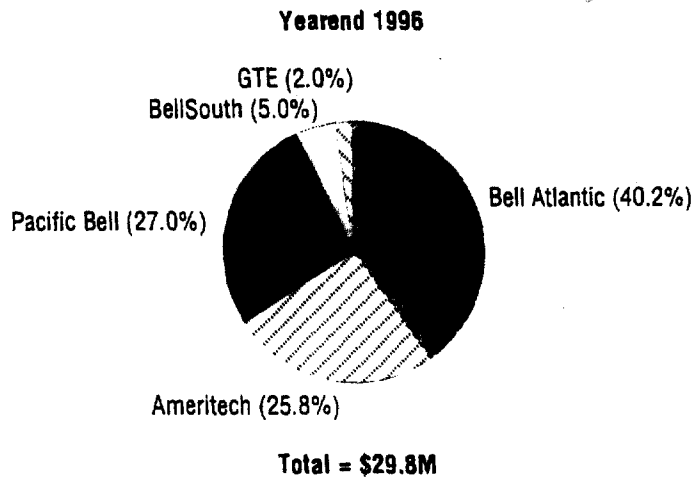
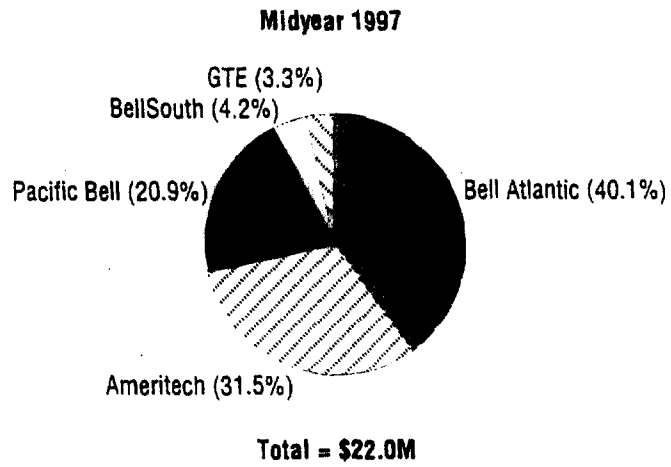
Source: International Data Corporation, 1997

Local SMDS Forecast Trends

Bell Atlantic leads the market with 40.1% of local SMDS revenue and 42.9% of local SMDS ports at midyear 1997.

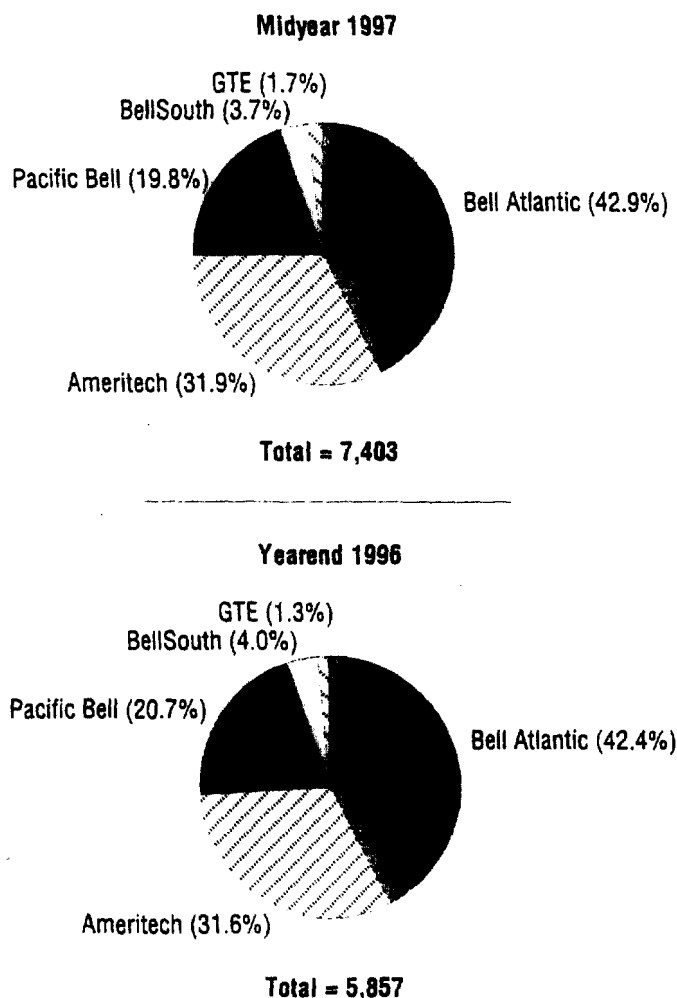
Local SMDS revenue amounted to \$29.8 million in 1996. Bell Atlantic leads the market with 40.1% of local SMDS revenue and 42.9% of local SMDS ports at midyear 1997 (see Figures 55 and 56). Ameritech accounted for 31.5% of revenue and 31.9% of ports at midyear 1997. Both Bell Atlantic and Ameritech are promoting SMDS aggressively — the former to ISPs, primarily, and the latter to state government. Pacific Bell, also a leading provider of local SMDS, focuses on vertical markets in the corporate sector, particularly the entertainment industry. (*Note:* Nynex, Southwestern Bell, and U S West garnered 0.0% share so are not represented in the figures.)

Figure 55
U.S. Local SMDS Service Revenue Share by Provider, Midyear 1997 and Yearend 1996



Source: International Data Corporation, 1997

Figure 56
U.S. Local SMDS Port Installed Base Share by Provider, Midyear 1997 and Yearend 1996

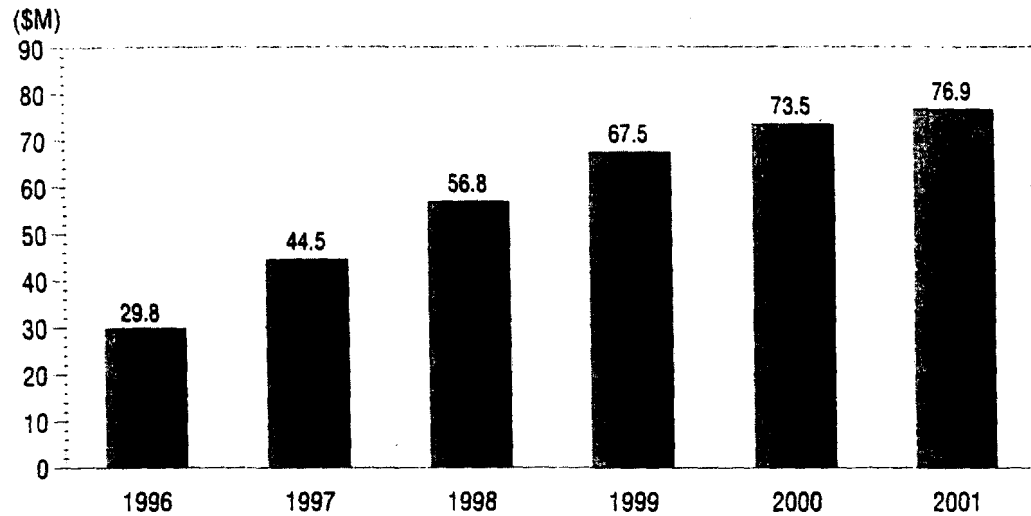


Source: International Data Corporation, 1997

Figure 57 shows that local SMDS revenue will increase to \$76.9 million in 2001. As shown in Table 41, the local providers' customer base will increase at a 1996–2001 CAGR of 6.3%, whereas port growth will proceed more rapidly (a 1996–2001 CAGR of 20.1%). During the forecast period, the bulk of local SMDS growth will result from existing customers' expanding their networks rather than new customer growth.

Table 42 shows that the local provider port speed mix will remain relatively stable during the forecast period, with slight growth in higher-speed connections as a result of existing customers' network expansion.

Figure 57
U.S. Local SMDS Services Revenue, 1996-2001



Source: International Data Corporation, 1997

Table 41
U.S. Local SMDS Customers and Port Installed Base, 1996-2001

	1996	1997	1998	1999	2000	2001	1996-2001 CAGR (%)
Customers	541	607	690	705	735	733	6.3
Ports	5,857	8,492	11,040	12,696	13,966	14,664	20.1
Average ports per customer	11	14	16	18	19	20	13.1

Source: International Data Corporation, 1997

Table 42
U.S. Local SMDS Port Installed Base Share by Access Speed, 1996-2001 (%)

	1996	1997	1998	1999	2000	2001
56Kbps	34.2	35.5	34.0	33.0	32.0	32.0
T1	55.5	54.5	56.0	55.5	56.5	56.5
Fractional T3	10.3	10.0	10.0	11.5	11.5	11.5
Total ports	5,857	8,492	11,040	12,696	13,966	14,664

Source: International Data Corporation, 1997

With regard to customer segment distribution, corporations' share of total revenue will increase from 41% in 1996 to 49% in 2001 (see Table 43). Government, with 35% of total revenue in 1996, will remain an important segment for providers such as Bell Atlantic and Ameritech, but will decrease to 26% of total revenue as corporations and ISPs expand their usage more rapidly. Other network service providers accounted for 16% of total revenue in 1996 and will increase their shares to 21% in 2001, driven largely by Bell Atlantic's aggressive efforts in the ISP space.

Table 43
U.S. Local Service Revenue Share by Customer Type, 1996-2001 (%)

	1996	1997	1998	1999	2000	2001
Corporate	41.3	41.0	43.0	45.0	47.0	49.0
Education	7.5	8.0	7.0	6.0	5.0	4.0
Government	35.0	34.0	32.0	30.0	28.0	26.0
Other network service providers	16.3	17.0	18.0	19.0	20.0	21.0
Total revenue (\$M)	29.8	44.5	56.8	67.5	73.5	76.9

Source: International Data Corporation, 1997

Local SMDS Forecast Assumptions

The following assumptions pertain to the local SMDS market:

- The following LECs currently offer SMDS: Ameritech, Bell Atlantic, BellSouth, GTE, and Pacific Bell. U S West discontinued its SMDS offering in March 1996, citing lack of customer demand.
- IDC does not foresee additional service provider entry into the SMDS market. However, IDC expects that mergers between LECs will accelerate carrier implementation of SMDS-to-ATM service interworking. For example, Nynex does not offer SMDS, but plans to roll out ATM commercially by yearend 1997. In light of the recent Bell Atlantic/Nynex merger, Bell Atlantic's support for service interworking will provide a bridge for SMDS and ATM customers. Similarly, Pacific Bell offers SMDS, but Southwestern Bell does not. However, Pacific Bell has not yet announced plans to either implement service interworking or migrate SMDS users to ATM.
- IDC forecasts that local SMDS port growth will level off sharply beginning in 1999 as other services curtail SMDS's growth — particularly as ATM makes further inroads into the corporate market segment.

IDC expects that mergers between LECs will accelerate carrier implementation of SMDS-to-ATM service interworking.

National/International SMDS Forecast Trends

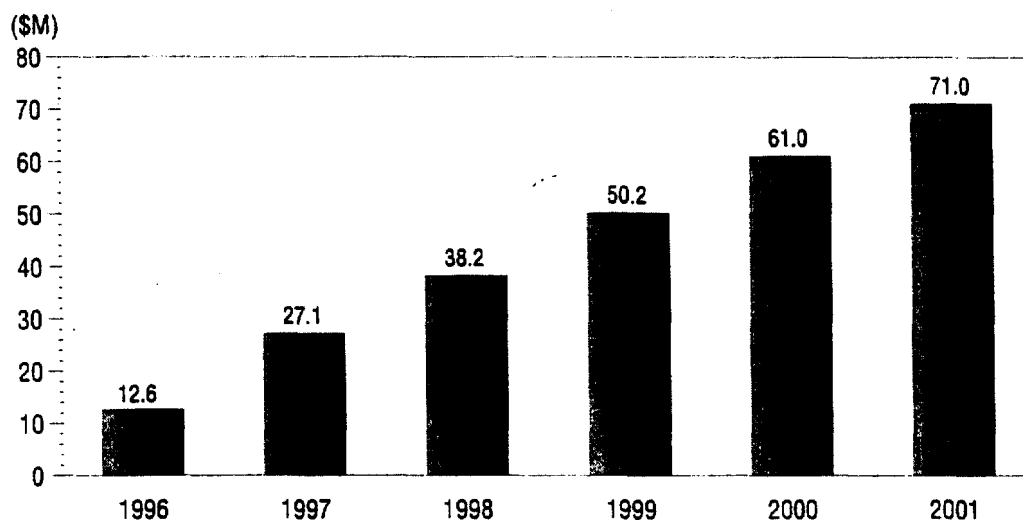
MCI is the sole national provider of SMDS.

MCI is the sole national provider of SMDS. Figure 58 shows that national/international SMDS revenue, which amounted to \$12.6 million in 1996, will reach \$71.0 million in 2001. As shown in Table 44, IDC forecasts that national providers' customer and port growth rates will track more closely than those of local providers (compare to Table 41).

The port speed mix will shift somewhat in favor of fractional T3 speeds, which are available only with MCI's data-exchange access SMDS (see Table 45).

With regard to customer segment distribution, the corporate segment, which accounted for 85% of total revenue in 1996, will increase its share to 90% in 2001 as government and education users migrate to other technologies or implement SMDS-to-ATM internetworking (see Table 46).

Figure 58
U.S.-Based National/International SMDS Service Revenue, 1996–2001



Source: International Data Corporation, 1997

Table 44
U.S.-Based National/International SMDS Customers and Port Installed Base, 1996–2001

	1996	1997	1998	1999	2000	2001	1996–2001 CAGR (%)
Customers	103	175	245	319	382	440	33.8
Ports	1,026	1,680	2,352	3,058	3,669	4,219	32.7
Average ports per customer	10	10	10	10	10	10	-0.8

Source: International Data Corporation, 1997

Table 45
U.S.-Based National/International SMDS Port Installed Base Share by Access Speed, 1996-2001 (%)

	1996	1997	1998	1999	2000	2001
56Kbps	25.0	25.0	25.0	24.0	24.0	24.0
T1	65.0	60.0	59.0	59.0	58.0	57.0
Fractional T3	10.0	15.0	16.0	17.0	18.0	19.0
Total ports	1,026	1,680	2,352	3,058	3,669	4,219

Source: International Data Corporation, 1997

Table 46
U.S.-Based National/International SMDS Services Revenue Share by Customer Type, 1996-2001 (%)

	1996	1997	1998	1999	2000	2001
Corporate	85.0	86.0	87.0	88.0	89.0	90.0
Education	5.0	4.5	4.0	3.5	3.0	2.5
Government	10.0	9.5	9.0	8.5	8.0	7.5
Other network service providers	0.0	0.0	0.0	0.0	0.0	0.0
Total revenue (\$M)	12.6	27.1	38.2	50.2	61.0	71.0

Source: International Data Corporation, 1997

National/International SMDS Forecast Assumptions

IDC's national/international SMDS forecast includes the following assumptions:

MCI will continue to support SMDS as an integral part of its business solutions portfolio.

- IDC does not expect additional IXC entry into the SMDS market, but believes that MCI will continue to support the service as an integral part of its business solutions portfolio. Strong support for SMDS in Europe (particularly the United Kingdom and Germany) will also contribute to SMDS growth.
- MCI is increasingly promoting its data-exchange interface service, which provides direct connection to MCI's nearest point of presence via LEC-provided private lines. Although MCI supports exchange-access SMDS (all of the LECs currently support the service), customers can avoid the LEC usage surcharges (assessed on a per-megabyte basis for access and egress) by connecting directly to MCI's SMDS network. As a result, MCI will boost its SMDS revenue by targeting more aggressively customers with inter-LATA needs. Nevertheless, the market for intra-LATA and LEC-to-LEC, inter-LATA service (particularly between Pacific Bell and GTE) will continue to grow.
- MCI introduced the industry's first service-level guarantee for SMDS in May 1997, which includes assurances regarding network availability, mean time to repair, one-way packet delay, and packet delivery. IDC predicts that the service-level

MCI introduced the industry's first service-level guarantee for SMDS in May 1997.

guarantee will increase prospective customers' comfort level with the service, driving additional demand.

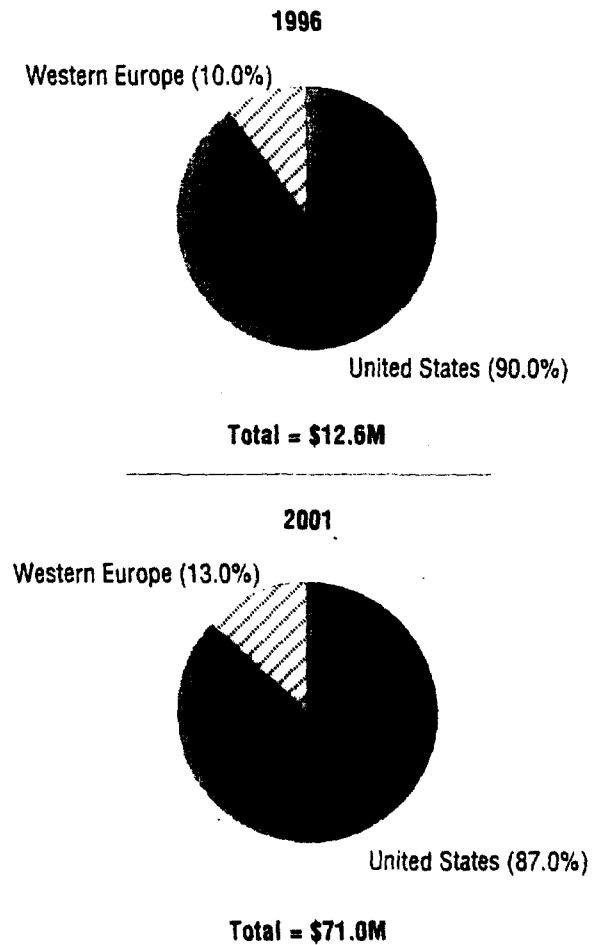
- MCI plans to roll out SMDS-to-ATM service interworking during the third quarter of 1997, providing a migration path for SMDS customers.
- MCI offers international SMDS service from the United States to the United Kingdom and Ireland. Table 47 and Figure 59 show that MCI's international SMDS revenue accounted for 10% of total revenue in 1996, increasing to 13% of the total in 2001.

Table 47
U.S.-Based National/International SMDS Service Revenue by Region, 1996-2001 (\$M)

	1996	1997	1998	1999	2000	2001	1996-2001 CAGR (%)
United States	11.4	24.3	34.0	44.2	53.4	61.8	40.3
Western Europe	1.3	2.8	4.2	5.8	7.3	9.2	48.9
Total	12.6	27.1	38.2	49.9	60.7	71.0	41.3

Source: International Data Corporation, 1997

Figure 59
U.S.-Based National/International SMDS Service Revenue Share by Region, 1996 and 2001



Source: International Data Corporation, 1997

Service Provider Profiles

Local/Regional Carriers

Ameritech

Ameritech's cell and packet service portfolio includes X.25, frame relay, ATM, and its SMDS offering, called Connectionless Broadband Data Service (CBDS).

In September 1996, Ameritech introduced an integrated suite of managed services. Provided under the brand name Ameritech GlobalDesk, this portfolio encompasses voice, data, video, and access services. GlobalDesk Managed Data Services provides equipment and support services for desktop-to-WAN management requirements. Other services include Ameritech Frame Relay, CBDS, and ATM. Support for these services is accomplished through an alliance between Ameritech and IBM Integrated Systems Solution Corporation (ISSC), whereby IBM ISSC provides desktop support services for GlobalDesk customers nationally.

X.25

Ameritech currently provides dedicated and dial-up access to its X.25 Packet Services via dial, ISDN, and private line. However, the company is migrating its customers' dedicated X.25 traffic to the ISDN D channel. Ameritech's X.25 platform is based on equipment from Nortel and Siemens. The provider offers transmission speeds from 2.4Kbps to 56Kbps.

Frame Relay

Ameritech's frame relay platform consists of Cascade 9000 and Lucent BNS 2000 switches. Ameritech offers frame relay access speeds of 56/64Kbps, FT1, and T1. The carrier also has pending a tariff for standardized T3 frame relay access. Expansion of existing customers' networks accounts for the majority of the carrier's frame relay growth, followed by migration from other Ameritech data services and a small percentage of new Ameritech data services customers.

Ameritech has concluded NNI agreements with Intermedia Communications Group and WorldCom. Ameritech supports multicast frame relay, but offers the service on an individual case basis, directing customers with broadcast requirements to its CBDS.

Customer Network Management services are included as part of the frame relay service package. This service enables customers to manage their networks and monitor the logical termination points on the network interfaces. Ameritech uses SNMP to report these network statistics.

Ameritech announced its support for voice over frame relay in September 1996, using Motorola's 6520 MPRouter. Motorola's

voice-over-frame-relay routers feature voice compression software, enabling high-quality audio and efficient bandwidth utilization.

ATM

To date, the company has experienced limited migration from frame relay to ATM; however, the service is structured to support service internetworking.

Ameritech launched its ATM services in 1994. ATM service is available in Chicago, Illinois; Indianapolis, Indiana; Detroit, Michigan; Dayton, Columbus, and Cleveland, Ohio; and Milwaukee, Wisconsin. To date, the company has experienced limited migration from frame relay to ATM; however, the service is structured to support service internetworking. Ameritech's ATM service is available at access speeds of T1, T3, and OC-3. CBR, VBR-NRT, and VBR-RT classes of service are available.

In March 1996, the company announced both ATM-to-the-desktop and frame-relay-to-ATM service internetworking. These services provide a company with a migration path to ATM without cutting into existing technology investments.

CBDS

CBDS is Ameritech's Connectionless Broadband Data Service. This type of SMDS is provided on Lucent Technologies and Cascade platforms. CBDS addresses multicasting requirements of customers; thus, this service is appropriate for applications in industries such as manufacturing, publishing, and medical imaging.

Existing CBDS customers are driving overall service growth, and Ameritech has a number of large customers with hundreds of ports each.

Bell Atlantic

Bell Atlantic's cell- and packet-based services portfolio includes frame relay, ATM, and SMDS.

Frame Relay

Bell Atlantic provides frame relay access from 56Kbps to T1. The carrier also offers nontariffed T3 frame relay service. Bell Atlantic's frame relay service growth is attributable to customer migration from private lines, expansion of existing customers' networks, and "win-backs" from other carriers.

In 1996, Bell Atlantic launched Exchange Access Frame Relay Service, which enables customers to link their LANs over widely dispersed geographical areas. Networks are linked to an NNI, and data is transmitted at speeds from 56Kbps to T1. In July 1997, Bell Atlantic signed its most recent NNI agreement with MCI. Bell Atlantic's other NNI agreements include pacts with ACSI, GTE, Intermedia Communications, LCI International, and WorldCom; the company also has a private agreement with Sprint.

Pricing for Bell Atlantic's frame relay services is shown in Table 48.

Table 48
Bell Atlantic's Frame Relay Pricing by Type of Charge

	Installation Charge (\$)	Monthly Charge (\$)
Month to month		
56/64Kbps	800	175
T1	1,000	435
Three-year term		
56/64Kbps	800	160
T1	1,000	400
Five-year term		
56/64Kbps	800	150
T1	1,000	380

Source: Bell Atlantic, 1997

Monthly CIR charges range from \$2 (56Kbps) to \$28 (768Kbps) per PVC. Customer Network Management is available for an additional \$25 per month. Bell Atlantic uses Cascade 9000 switches.

ATM

Through its All@Once Solutions Center, Bell Atlantic rolled out its ATM Cell Relay service in Pennsylvania in June 1996. Since then, growth has been rapid, and the service is currently available in all states except West Virginia. The service operates on a Cascade 500 switch and is available at access speeds of T1 (nontariffed), T3, and OC-3. Bell Atlantic ATM Cell Relay is tariffed in Pennsylvania and Virginia, with tariffs pending in other states. Pricing is based on a flat-rate, distance-sensitive structure (see Table 49).

Table 49
Bell Atlantic's ATM Pricing

Port Speed	Monthly Recurring Charge (\$)
DS3 (10Mbps to 45Mbps)	3,000 to 4,200
OC3 (25Mbps to 155Mbps)	5,500 to 7,200 (SONET)
	3,800 to 6,500 (fiber)
	Direct fiber

Source: Bell Atlantic, 1997

Bell Atlantic plans to introduce frame-relay-to-ATM service internetworking during the third quarter of 1997, with SMDS-to-ATM service internetworking and ATM SVCs planned by yearend 1997.

VBR service accounts for the bulk of Bell Atlantic's ATM revenue. Bell Atlantic plans to introduce frame-relay-to-ATM service internetworking during the third quarter of 1997, with SMDS-to-ATM service internetworking and ATM SVCs planned by yearend 1997.

SMDS

Bell Atlantic introduced its SMDS in 1992. Initially rolled out city by city, Bell Atlantic now offers SMDS throughout its entire operating region. The service is available at port speeds ranging from 56Kbps to 34Mbps. Bell Atlantic's SMDS is provided over a backbone consisting of Lucent, Siemens, and Cascade switches. The carrier plans to roll out SMDS-to-ATM service internetworking by the end of 1997.

In October 1996, Bell Atlantic announced the availability of fast-packet Internet access for colleges and universities in Virginia. Provided through the company's All@Once Solution Center, this offering enables users of the Virginia Education and Research Network (VERnet) to access the Internet via SMDS.

BellSouth

BellSouth provides X.25, frame relay, ATM, and SMDS.

X.25

BellSouth's X.25 services are provided over a Nortel DPN backbone. The carrier provides access at speeds of 9.6Kbps to 56Kbps.

Frame Relay

Access to BellSouth's frame relay services is provided at speeds ranging from 56Kbps to NxT1/T3. BellSouth's frame relay customer growth is driven predominantly by users replacing their private line networks because frame relay provides better support for internetworking between LANs. BellSouth uses Cascade switches.

Table 50 presents BellSouth's frame relay pricing.

In September 1996, BellSouth announced a strategic comarketing agreement with Netlink to integrate Netlink's OmniLink family of FRADs into BellSouth's frame relay services.

In September 1996, BellSouth announced a strategic comarketing agreement with Netlink to integrate Netlink's OmniLink family of FRADs into BellSouth's frame relay services. Products include TurboFRAD (branch site access), OmniFRAD (data center access), NetFRAD (network-based access), OmniLink Switch (for private and hybrid networks), and OmniView SNMP (for network management reports).

Table 50
BellSouth Frame Relay Pricing by Connection Speed

Connection Speed	Monthly Cost (\$)	CIR per Data Link Connection Identifier	Monthly Recurring Charge (\$)
56Kbps	80	1-32Kbps	7
64Kbps	80	33-56Kbps	12
1.536Mbps	410	57-64Kbps	13
		65-128Kbps	18
		129-256Kbps	24
		257-384Kbps	28
		385-512Kbps	32
		513-768Kbps	36
		769Kbps-T1	55
		1.537-4Mbps	120
		5-10Mbps	160
		11-16Mbps	226
		17-34Mbps	250
		35-44.210Mbps	370

Note: All prices are nondiscounted.

Source: BellSouth, 1997

ATM

BellSouth launched its broadband ATM service in June 1995 and currently provides tariffed service in North Carolina. Service is also available in other BellSouth states on a customized basis. The service is available at T1, T3, and OC-3 access speeds. Available classes of service are CBR, VBT-NRT, VBR-RT, and UBR.

BellSouth has ATM service interconnection agreements with GTE and Sprint Local in North Carolina. Service pricing is flat rate based and distance sensitive. The service supports Internet access at T1, T3, and OC-3.

CDS

BellSouth's SMDS offering, called Connectionless Data Service (CDS), provides access at speeds from 56Kbps to T1. The service supports LAN-based and single-device connections. BellSouth provides its CDS over a Cascade platform. CDS is available throughout the nine-state region on a contractual basis.

Nynex

Nynex's cell- and packet-based service offerings include X.25 and frame relay.

X.25

The majority of Nynex's X.25 customers access the network at 9.6Kbps. Internet access, financial applications, and banking transactions continue to fuel the growth of these services. The Nynex platform is based on Nortel's DPN equipment.

Frame Relay

Nynex's frame relay services are provided to customers over a Newbridge platform. As of mid-1996, the carrier had installed 46 switches.

ATM

Nynex has conducted ATM trials, but commercial service has not yet been rolled out. A fourth-quarter 1997 commercial launch is scheduled.

Pacific Bell

Pacific Bell offers an entire suite of data services, including X.25, frame relay, ATM, and SMDS.

X.25

Although slow, growth for Pacific Bell's X.25 service is being fueled by financial transactions, credit card authorization, remote access, and "always on" ISDN D-channel connections for telecommuting. Currently, the carrier has an installed base of more than 1,500 connections and employs a Nortel platform for its X.25 service. All of Pacific Bell's X.25 connections are terminal to host.

Frame Relay

Pacific Bell expects to see a rapid customer shift from T1 to T3 during late 1997 and early 1998.

From mid-1996 to mid-1997, Pacific Bell experienced more than 100% revenue growth from its FasTrak frame relay service. In May 1997, the carrier launched a DS3 high-speed frame relay solution. Fractional T3 is also available on a case-by-case basis. Pacific Bell expects to see a rapid customer shift from T1 to T3 during late 1997 and early 1998. Pacific Bell plans to introduce dial-up frame relay service during 3Q97.

Pricing for Pacific Bell's FasTrak service is illustrated in Table 51.

Approximately 54% of the carrier's frame relay ports are installed at 56Kbps. The remaining 44% of ports are split almost evenly between fractional T1 and full T1. Corporations and government account for most of Pacific Bell's frame relay customer base, with other network service providers (mostly ISPs) accounting for the remainder. Most of the carrier's frame relay customers are medium-sized establishments.

Table 51
Pacific Bell FasTrak Frame Relay Pricing

	Cost (\$)
Port speeds	
56Kbps	375 installation, 75 per month
128Kbps	375 installation, 150 per month
384Kbps	375 installation, 400 per month
1.544Mbps	375 installation, 500 per month
Access costs (service area tariff prices)	
56Kbps	630 installation, 50 per month
128Kbps, 384Kbps, and 1536Kbps	634 installation, 175 per month
Access Costs (Interstate Tariff Prices)	
56Kbps	375 installation, 50 per month
128Kbps, 384Kbps, and 1536Kbps	634 installation, 120 per month
Data link connection identifiers (based on the number of connections — one per port)	
1 connection	No charge
2 to 6 connections	15 each
7 to 11 connections	10 each
12 connections or more	5 each

Source: Pacific Bell, 1997

At mid-1997, Pacific Bell provided managed frame relay service for 20% of its new customers.

Pacific Bell is expanding its network integration efforts. In April 1997, the carrier introduced FasTrak Managed Frame Relay Service, an end-to-end solution that includes network design, implementation, equipment, frame relay transport, and ongoing maintenance and management. At mid-1997, Pacific Bell provided managed frame relay service for 20% of its new customers.

Pacific Bell plans to introduce multicast frame relay and frame-to-ATM internetworking in 1997. Pacific Bell has NNI agreements with GTE, WorldCom/MFS, Electric Lightwave, PacNet, and Intermedia Communications; the company also has private NNIs with MCI and Sprint. The carrier uses Newbridge 36120 and Cascade 9000 frame relay platforms.

ATM

Pacific Bell broadened its ATM Cell Relay portfolio in November 1996, introducing enhanced ATM service. The fractional ATM service is available in increments beginning at 64Kbps, with DS1 rates available from 128Kbps to 1.544Mbps. DS3 rates are available in 1Mbps increments from 4Mbps to 40Mbps and OC-3C in 1Mbps increments that range from 51Mbps to 148Mbps. CBR and VBR data transport will be available on the same customer interface, allowing data/voice/video aggregation. Enhanced ATM service is available in the San Francisco, Los Angeles, and Orange County areas, but can be configured in other Pacific Bell regions. Statewide availability for all FasTrak ATM services is planned for yearend 1997.

Other network service providers (mostly ISPs) represent approximately one-quarter of Pacific Bell's ATM customer base. Pacific Bell's ATM services growth is driven by (in order of importance) additional connections for existing customers, connections for the Pacific Bell-managed Internet Network Access Point (NAP), migration from other data services, and new customers. VBR-NRT service accounts for the majority of Pacific Bell's ATM service revenue, with CBR making up the balance. At mid-1997, approximately 65% of the carrier's ATM traffic was data; video and voice represented 20% and 15% of total ATM traffic, respectively.

Pricing for Pacific Bell's ATM service is structured as follows:

- DS1: \$884 per month, with an installation charge of \$775
- DS3: \$4,850 per month, with an installation charge of \$5,000
- OC-3C: \$7,899 per month, with an installation charge of \$8,500

These charges include the loop, port, interoffice facility, and one PVC. There is no charge for mileage or usage within a LATA.

Pacific Bell plans to introduce managed ATM service by yearend 1997.

Pacific Bell plans to introduce managed ATM service by yearend 1997 and anticipates that 10% of ATM customers will opt for managed service. The carrier's ATM service is provided on Newbridge 36170 and StrataCom BPX platforms.

SMDS

Pacific Bell's SMDS customer base stands at 144 at mid-1997. Corporations and government represent most of Pacific Bell's SMDS customer base. ISPs and educational institutions round out the customer base.

Pacific Bell's SMDS are offered in 8 of California's 10 LATAs (the exceptions are Bakersfield and San Luis Obispo). Pacific Bell has a complementary arrangement with MCI for SMDS interconnection. Approximately 90% of the carrier's SMDS connections are LAN based. The remaining 10% of single device-based connections are used primarily by ISPs.

Pacific Bell's SMDS equipment platforms are the Lucent BNS 2000 and Cascade 9000. Pricing for Pacific Bell's SMDS is presented in Table 52.

Table 52
Pacific Bell's SMDS Pricing by Connection Speed

Connection Speed	Monthly Rate (\$)	Installation Charge (\$)
56Kbps	95	376
DS1	600	376
DS3		
4Mbps	1,100	1,500
10Mbps	1,300	1,500
16Mbps	1,500	1,500
25Mbps	1,700	1,500
34Mbps	1,800	1,500

Notes: These rates reflect inter-LATA access tariffs. Access facility charges are \$175 per month (DS1) and \$2,200 per month for all DS3 speeds.

Source: Pacific Bell, 1997

Southwestern Bell

Southwestern Bell's cell- and packet-based services portfolio includes X.25, frame relay, and ATM.

X.25

The carrier is migrating its X.25 customer base to ISDN.

Frame Relay

Southwestern Bell's frame relay service is based on a Newbridge 36170 platform, recently upgraded from the 36150 platform. The service is available at access speeds of 56Kbps to T1. The carrier is currently testing a DS3 frame relay interface and plans to deploy the service in late 1997 or early 1998. Southwestern Bell also plans to introduce dial-up frame relay access in early 1998 as a disaster-recovery option.

Managed frame relay solutions, already offered on an individual-case basis for large customers, will be rolled out as a general availability option by yearend 1997.

Managed frame relay solutions, already offered on an individual-case basis for large customers, will be rolled out as a general availability option by yearend 1997. Web-based customer network management services also will be rolled out by yearend 1997. Southwestern Bell offers frame relay services throughout all of its LATAs.

ATM

Southwestern Bell rolled out its ATM services in July 1996. The carrier's ATM Cell Relay Service is available in all major regional cities. Access speeds include T1, T3, and OC-3. VBR-NRT, VBR-NT,